

Express5800/320Ma: Site Planning Guide

NEC Solutions (America), Inc.
NR573

Notice

The information contained in this document is subject to change without notice.

UNLESS EXPRESSLY SET FORTH IN A WRITTEN AGREEMENT SIGNED BY AN AUTHORIZED REPRESENTATIVE OF NEC, NEC MAKES NO WARRANTY OR REPRESENTATION OF ANY KIND WITH RESPECT TO THE INFORMATION CONTAINED HEREIN, INCLUDING WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PURPOSE. NEC assumes no responsibility or obligation of any kind for any errors contained herein or in connection with the furnishing, performance, or use of this document.

Software described in NEC (a) is the property of NEC and/or its licensees, (b) is furnished only under license, and (c) may be copied or used only as expressly permitted under the terms of the license.

NEC documentation describes all supported features of the user interfaces and the application programming interfaces (API) developed by NEC and/or its licensees. Any undocumented features of these interfaces are intended solely for use by NEC personnel and are subject to change without warning.

This document is protected by copyright. All rights are reserved. No part of this document may be copied, reproduced, or translated, either mechanically or electronically, without the prior written consent of NEC Solutions (America), Inc.

The NEC Solutions (America), Inc. logo, Express5800/320Ma, and the Express5800/320Ma logo, are trademarks of NEC Solutions (America), Inc. ActiveService Network is a trademark of Stratus Technologies Bermuda, Ltd. All other trademarks and trade names are the property of their respective owners.

Manual Name: *Express5800/320Ma: Site Planning Guide*

Part Number: NR573

Express5800/320Ma Software Release Number: 4.1.0

Publication Date: January 2006

NEC Solutions (America), Inc.
10850 Gold Center Drive, Suite 200
Rancho Cordova, CA 95670

© 2006 NEC Solutions (America), Inc. All rights reserved.

Contents

Preface	vii
----------------	-----

1. Welcome to Site Planning for Express5800/320Ma 3.2 GHz, 3.6 GHz, and Dual-Core systems	1-1
Site Planning Overview	1-1
Site Planning for Fault-Tolerant Systems	1-2
Site Planning Checklist	1-3
System Documentation	1-5

2. Cabinet and Monitor Requirements	2-1
Cabinet Requirements	2-1
Monitor Requirements	2-4

3. Space Planning	3-1
Room Requirements	3-1
Planning for Cables	3-2

4. Electrical (AC) Power Planning	4-1
Redundant Power Sources	4-1
AC Power Service Requirements	4-2
Power Outlet Requirements	4-4
Connecting a System Directly to Two Separate Power Sources	4-5
NEC-Supplied Power Cords	4-6
System Power Cords	4-7
PDU Power Cords	4-8
Power Cords for Optional Components	4-9

5. UPS Planning	5-1
------------------------	-----

Qualified APC UPS Models	5-1
Communicating with a UPS over a Network	5-2
Connecting Power to Systems, PDUs, and a UPS	5-3
Connecting a System Directly to a UPS	5-4

6. Network and Telephone Line Planning	6-1
Network Cable Requirements	6-1
Telephone Line Requirements	6-2
Site Planning for Systems in an ftGateway Group	6-3

7. Rack Configuration Planning	7-1
Using PDUs	7-1
Determining PDU Requirements	7-2
Sample PDU Usage Calculation	7-4

Appendix A. System Specifications	A-1
System Specifications	A-1
Rack-Mountable System Specifications	A-7

Appendix B. Electrical Circuit and Wiring Information	B-1
Fault Protection Requirements	B-1
Grounding Considerations	B-1
Circuit Wiring Diagrams	B-3
Electrical Power Connectors	B-9

Appendix C. Standards Compliance	C-1
---	-----

Index	Index-1
--------------	---------

Figures

Figure 2-1.	Rail Clearance	2-3
Figure 4-1.	Rack-Mounted System Connected Directly to AC Power	4-6
Figure 4-2.	Pedestal System Connected Directly to AC Power	4-6
Figure 5-1.	Power Cord Connections for Systems, PDUs, and a UPS	5-3
Figure 5-2.	Rack-Mountable Systems: A-Side Power Connected Directly to a UPS	5-4
Figure 5-3.	Pedestal Systems: A-Side Power Connected Directly to a UPS	5-5
Figure A-1.	Pedestal System - Front View	A-2
Figure A-2.	Pedestal Express5800/320Ma 3.2 GHz systems - Rear View	A-3
Figure A-3.	Pedestal Express5800/320Ma 3.6 GHz systems- Rear View	A-4
Figure A-4.	Rack-Mountable System - Front View	A-7
Figure A-5.	Rack-Mountable Express5800/320Ma 3.2 GHz system - Rear View	A-8
Figure A-6.	Rack-Mountable Express5800/320Ma 3.6 GHz or Dual-Core System - Rear View	A-9
Figure B-1.	Star Ground Example	B-2
Figure B-2.	Power Input Labeling	B-3
Figure B-3.	Single-Phase 120-Volts AC Circuit Connection	B-4
Figure B-4.	Single-Phase 240-Volts AC Circuit Connection	B-5
Figure B-5.	Split-Phase 120/240 Volts AC Circuit Connection	B-6
Figure B-6.	Three-Phase 208-Volts AC, Y-, or Δ -Source Circuit Connection, Phase-to-Neutral	B-7
Figure B-7.	Three-Phase 208-Volts AC, Y-, or Δ -Source Circuit Connection, Phase-to-Phase	B-8
Figure B-8.	Three-Phase 380V AC, Y-, or Δ -Source Circuit Connection, Phase-to-Neutral	B-9

Tables

Table 1-1.	Ethernet PCI Adapters	1-4
Table 1-2.	Optical Fibre Channel PCI Adapters	1-4
Table 1-3.	Express5800/320Ma Documentation	1-6
Table 4-1.	AC Power Service Requirements	4-2
Table 4-2.	Worksheet for Determining A-Side Power Requirements	4-3
Table 4-3.	Worksheet for Determining B-Side Power Requirements	4-3
Table 4-4.	Worksheet for Determining External Power Requirements	4-3
Table 4-5.	Worksheet: A-Side External Power Outlet Requirements - PDUs Used	4-4
Table 4-6.	Worksheet: B-Side External Power Outlet Requirements - PDUs Used	4-4
Table 4-7.	Worksheet: A-Side External Power Outlet Requirements - No PDUs	4-5
Table 4-8.	Worksheet: B-Side External Power Outlet Requirements - No PDUs	4-5
Table 4-9.	System Power Cords to AC Power	4-7
Table 4-10.	Systems: Power Cords to a UPS	4-8
Table 4-11.	PDU Power Cords to AC Power	4-9
Table 4-12.	System Power (<i>Jumper</i>) Cables to a PDU	4-9
Table 4-13.	Power Cords for Optional Components	4-9
Table 5-1.	APC Symmetra Models for PDUs or for Multiple Systems	5-1
Table 5-2.	APC UPS Models for a Single Rack-Mountable System	5-2
Table 5-3.	APC UPS Models for a Single Pedestal System	5-2
Table 6-1.	Customer-Supplied Ethernet Cables	6-2
Table 7-1.	Current and Rack-Space Requirements	7-2
Table 7-2.	Calculating A-Side PDU and Rack-Space Requirements	7-3
Table 7-3.	Sample: Current and Rack-Space Requirements	7-4
Table 7-4.	Sample: Calculating A-Side PDU and Rack-Space Requirements	7-4
Table A-1.	Pedestal System Specifications	A-5
Table A-2.	Cabinet Dimensions	A-10
Table A-3.	Rack-Mountable System Specifications	A-11
Table B-1.	Connectors for AC Power Outlets	B-10
Table C-1.	EMI Standards	C-2
Table C-2.	Immunity Standards	C-2
Table C-3.	Safety Standards	C-2
Table C-4.	Noise Standards	C-2

Purpose of This Manual

The *Express5800/320Ma: Site Planning Guide* documents the site requirements and customer responsibilities related to preparing a site for the installation of Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core systems.

Audience

This manual is intended for those responsible for preparing a site for the installation of an Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core system.

Notation Conventions

This document uses the notation conventions described in this section.

Warnings, Cautions, and Notes

Warnings, cautions, and notes provide special information and have the following meanings:



WARNING _____

A warning indicates a situation where failure to take or avoid a specified action could cause bodily harm or loss of life.



CAUTION _____

A caution indicates a situation where failure to take or avoid a specified action could damage a hardware device, program, system, or data.

NOTE _____

A note provides important information about the operation of an Express5800/320Ma system.

Typographical Conventions

The following typographical conventions are used in Express5800/320Ma documents:

- The bold font emphasizes words in text or indicates text that you type or the name of a screen object. For example:

Before handling or replacing a PCI adapter, make sure that you are properly grounded by using a grounded wrist strap.

In the **System Properties** dialog box, click the **Hardware** tab.

- The italic font introduces new terms. For example:

Many hardware components are *customer-replaceable units* (CRUs), which can be replaced on-site by system administrators with minimal training or tools.

copy *filename1 filename2*

- The monospace font indicates message text. For example:

The operation completed successfully.

Getting Help

If you have a technical question about Express5800/320Ma hardware or software, try these online resources first:

- **Online support from NEC Technical Support.** You can find the latest technical information about an Express5800/320Ma through online product support at the [NEC Technical Support Web site](http://support.necsam.com/servers/):

<http://support.necsam.com/servers/>

- **Online product support for Microsoft® products.** Your primary source for support is the computer manufacturer who provided your software, or an authorized Microsoft Support Provider. You can also find the latest technical information about Microsoft Windows® and other Microsoft products through online product support at the [Microsoft Help and Support Web site](http://support.microsoft.com/):

<http://support.microsoft.com/>

If you are unable to resolve your questions with the help available at these online sites, and the Express5800/320Ma system is covered by a service agreement, please contact [NEC Technical Support](http://support.necsam.com/servers/) (866-269-1239).

Notices

- All regulatory notices are provided in [Appendix C, “Standards Compliance”](#) of this site planning guide.
- Although this guide documents modem functionality, modems are not available for all systems. Ask your sales representative about modem availability.
- ActiveService Network (ASN) is not currently available, but may be ordered in the future.

Chapter 1

Welcome to Site Planning for Express5800/320Ma 3.2 GHz, 3.6 GHz, and Dual-Core systems

For an overview of the information you need to know and of the tasks you need to perform to prepare a site for an Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core system, see:

- [“Site Planning Overview” on page 1-1](#)
- [“Site Planning for Fault-Tolerant Systems” on page 1-2](#)
- [“Site Planning Checklist” on page 1-3](#)
- [“System Documentation” on page 1-5](#)

Site Planning Overview

[Site planning for fault-tolerant systems](#) includes:

- [Space planning](#)

Provide adequate space for the system or cabinet and for a desk or table to accommodate components outside a cabinet. Also provide enough space for servicing the systems and components.

- [Purchasing an appropriate cabinet and monitor](#)

If you do not purchase a monitor from NEC Solutions (America), Inc., provide a monitor that meets the system's requirements.

If you do not purchase the cabinet that NEC Solutions (America), Inc. references, provide a cabinet that meets the system's requirements.

- [Electrical \(AC\) power planning](#)

Provide electrical power sources that meet the system's requirements, optionally including the purchase of a qualified [uninterruptible power supply \(UPS\)](#).

- [Network and telephone line planning](#)

Provide sufficient network and analog telephone lines.

Use the “[Site Planning Checklist](#)” on page 1-3 to track your site preparation progress.

For a list of other documents related to your Express5800/320Ma system, see “[System Documentation](#)” on page 1-5.

During the site planning and preparation processes, work closely with your facilities group or contractor to determine space, power, and environmental requirements. Enlist their help to provide a suitable location with sufficient alternating current (AC) power, heating, ventilation and air conditioning (HVAC) capabilities, and network and telephone connections.

If your system is covered by a service agreement and you need help with site planning, contact the NEC Technical Support. If you have a contract with the NEC Technical Support to install the system, contact them after you have prepared the installation site and moved the system to the site. For more information about NEC Technical Support, visit <http://support.necsam.com/servers>.

See [Appendix A, “System Specifications”](#) for Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core system specifications and the *Express5800/320Ma: Peripherals Site Planning Guide* for specifications of other components.

Site Planning for Fault-Tolerant Systems

Consider the following specific fault-tolerant features of Express5800/320Ma 3.2 GHz, 3.6 GHz, and Dual-Core systems for site planning:

- *Lockstep technology* means that the Express5800/320Ma 3.2 GHz and 3.6 GHz systems contain redundant hardware. The Express5800/320Ma 3.2 GHz and 3.6 GHz systems contain two enclosures, each containing a full computing environment that consists of a CPU element and an I/O element.

If a component in a CPU element malfunctions, the corresponding CPU element in the other enclosure, which is processing the same information in *lockstep*, continues processing without interruption. If a component in the I/O element malfunctions, the system fails operation over to the corresponding element in the other enclosure and continues to operate normally. The only consequences are that the system is less fault tolerant, and any I/O throughput distributed between the enclosures may be reduced. To restore full fault tolerance, an enclosure can be replaced without taking the system offline.

- Express5800/320Ma 3.2 GHz and 3.6 GHz systems can connect to the ActiveService Network (ASN).

Connecting a system to the ASN allows the NEC Technical Support to remotely diagnose, troubleshoot, and resolve problems online.

To enable connectivity to the ASN, a modem can be attached directly to the system and managed by Windows Server software or two partnered Virtual Technician Modules (VTMs) in the system. The VTMs can also connect to the ASN through their Ethernet ports, if the network to which they are attached has Internet access.

Systems that connect to the ASN using partnered VTMs provide the highest level of availability. VTMs provide ASN connectivity even when the operating system is not operational. VTMs also allow internal administrators to remotely service the system over a telephone line or IP network, regardless of the state of the operating system.

Without VTMs, ASN connectivity is only possible if the operating system is operational.

Site Planning Checklist

Referring to the information in this document, answer the following questions:

Planning for ASN Connectivity

- ☐ Will your system use VTMs to connect to the ASN?
- ☐ If your system uses VTMs, will you connect them to a network so that you can manage the server from a remote system? Are there maintenance network connections to which you can connect the VTMs?
- ☐ If your VTMs are connected to a network, does the network have Internet connectivity so that the system can connect to the ASN without a modem?
- ☐ If your system uses an ASN modem, do you have an external analog telephone line available for the modem?

NOTE

A dedicated phone line provides the most reliable service. ASN calls routed through a PBX may be slow due to load on the PBX, or may not complete successfully due to disconnections. If you must use a PBX, do not route the telephone extension through a switchboard; instead, provide a direct-dial analog number.

- ☐ Do you have an additional telephone line and telephone near the operator's station for voice communications when calling for support?

Planning for Optional Components

- ☐ The system contains four 10/100/1000 megabits-per-second (Mbps) Ethernet ports. Will your system additionally include any of the following PCI adapters for network communications? If so, indicate how many of each and plan network connections for all Ethernet ports you will use.

Table 1-1. Ethernet PCI Adapters

Adapter	Number of Ports
U575 Dual-Port Copper Gigabit Ethernet Adapter	

- ☐ Will your system connect to an EMC® CLARiiON® AX100® storage system? If so, the system requires one pair of U531 Optical Fibre Channel PCI Adapters, which are provided when you order the storage system.
- ☐ Will your system connect to EMC CLARiiON CX or to EMC Symmetrix® storage systems? If so, the system requires one pair of optical fibre channel PCI adapters, as described in [Table 1-2](#).

Table 1-2. Optical Fibre Channel PCI Adapters

Attachment Method	PCI Adapter
Through a Storage Area Network (SAN) or switch	U525 Optical Fibre Channel PCI Adapter, two of which are provided in the AK415 Attachment Kit
Directly attached	U526 Optical Fibre Channel PCI Adapter, two of which are provided in the AK419 Attachment Kit

- ☐ Will you supply your own monitor or will NEC Solutions (America), Inc. supply the monitor?

NOTE _____

Use the USB keyboard and mouse supplied by NEC Solutions (America), Inc..

- ☐ Will the components in a cabinet include a keyboard-video-mouse (KVM) switch?

Planning AC Power

- ☐ Will you provide power through a power distribution unit (PDU)?
- ☐ Will you provide power from a UPS?
- ☐ What are the AC power requirements of your system, including all optional components?
- ☐ Is the AC power service wired properly?
- ☐ What are the lengths and types of the power cords that are provided with your system? What type of receptacles do you need to provide?

Planning Space for Your System

- ☐ Will your system and its external components fit where you plan to place them?

- ☐ If you are rack-mounting the system, what is the height of the cabinet you will use and what is the total height of the systems and components that will be installed in the cabinet? Will the items fit into the cabinet? What components will be located outside the cabinet?
- ☐ What are the lengths and types of the cables that will connect to your system?
- ☐ Have you created a sketch of how you plan to arrange the system at the installation site? Consider the available cable lengths, the placement of external devices, and the location of network and voice communication connections.

On the sketch, show the following:

- Location of the system and its external components
- Power cords, and telephone and interface cables
- Locations of AC power receptacles, phone jacks, Ethernet jacks, switches, and/or hubs

NOTE _____

Make sure that all cords and cables are long enough to reach between their respective components and connectors. Route all cables out of the way of foot traffic.

Working with Other Groups

- ☐ Have you provided your facilities group and contractors with the sketch and copies of the following?
 - Tables 4-2, 4-3, and 4-4, worksheets for determining AC power requirements
 - Tables 4-5 and 4-6 or Tables 4-7 and 4-8, worksheets for determining the number of external power outlets required
 - [Appendix B, “Electrical Circuit and Wiring Information”](#)
 - Any notes you have about site planning
- ☐ Have you reviewed and discussed the requirements with the facilities personnel and contractors to ensure that all site modifications are understood and implemented?

If you have any questions about the number and types of components, contact your Express5800/320Ma account executive or distributor.

System Documentation

When you receive your system, you receive a printed copy of the *Express5800/320Ma: Installation Guide*. The software installation program lets you install an online copy of

this document, along with other Express5800/320Ma system documentation, on your system. You also have the option to install documentation on a remote system. The **Express5800/320Ma Help and Manuals** folder on the Windows desktop, contains these documents.

To order additional documentation, visit the [NEC Technical Support Web site](http://support.necsam.com/servers/):

<http://support.necsam.com/servers/>

Express5800/320Ma Express5800/320MaExpress5800/320MaTable 1-3 lists Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core system documents and the tasks described in each document.

Table 1-3. Express5800/320Ma Documentation

Document	Task
<i>Express5800/320Ma: Site Planning Guide</i>	Prepare a site for installation of your Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core system.
<i>Express5800/320Ma: Installation Guide</i>	Install your system, including mounting the system in a cabinet Find the part number of a customer-replaceable unit (CRU) Respond to Mini-Setup questions on your new Express5800/320Ma system Install Express5800/320Ma System software and Windows Server on your new system
<i>Express5800/320Ma: Operation and Maintenance Guide</i>	Start up, shut down, and operate your system Troubleshoot system hardware Remove and replace CRUs
<i>Release Notes: Express5800/320Ma</i>	Learn the contents of the latest Express5800/320Ma software release Learn the latest information about the product Learn about significant known problems and how to work around or avoid the problems

Table 1-3. Express5800/320Ma Documentation (Continued)

Document	Task
<i>Express5800/320Ma: Software Installation and Configuration Guide</i>	Respond to Mini-Setup questions Install or reinstall Express5800/320Ma System software and Windows Server software Upgrade software and BIOS, BMC, and VTM firmware Configure Express5800/320Ma System software Connect a UPS to your system
<i>Express5800/320Ma ActiveService Network Configuration Guide</i>	Configure your system for support by the NEC ActiveService Network (ASN)[†] Configure the VTMs
<i>Express5800/320Ma Virtual Technician Module User's Guide</i>	Configure and use VTMs to remotely control, monitor, and troubleshoot your system
<i>Express5800/320Ma: System Administrator's Guide</i>	Use tools that are provided by Windows Server software or Express5800/320Ma System Software and by other vendors to manage the system Use ftServer Management Console (ftSMC) to administer or troubleshoot Express5800/320Ma systems
<i>Express5800/320Ma Software Availability Manager User's Guide</i>	Monitor the performance of critical system components and the status of user applications
<i>Express5800/320Ma: PCI Adapter Guide</i>	Install, configure, replace, or troubleshoot PCI adapters
<i>Express5800/320Ma: Technical Reference Guide</i>	Consult technical reference information for Express5800/320Ma systems Change BIOS settings

[†] ActiveService Network (ASN) is not currently available, but may be ordered in the future.

Chapter 2

Cabinet and Monitor Requirements

For requirements related to supplying your own cabinet and monitor, see:

- [“Cabinet Requirements” on page 2-1](#)
- [“Monitor Requirements” on page 2-4](#)

Cabinet Requirements

If you are providing your own cabinet for an Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core systems, make sure the cabinet contains a rack that is 19-in. wide and that meets the Electronic Industries Association (EIA) 310-D standard.

Make sure that:

- The cabinet contains two front and two rear vertical EIA rails, one in each corner of the cabinet, that have the EIA universal square-hole pattern as defined in the EIA 310-D specification.
- The front vertical rails extend at least 0.5 in. (1.27 cm) beyond the inside edge of the accessory leg, if present, to allow the mounting rails to be fitted. See [Figure 2-1](#).
- The distance between the front and rear vertical rails is between 24.5 in. and 30 in. (62.23 cm and 76.20 cm).
- The vertical mounting rails accept 10-32 cage nuts and mounting hardware.
- The distance between the front vertical rails and the inside of the front door is at least 3.0 in. (7.62 cm).
- The distance between the rear of the system chassis and the inside of the rear door is at least 6.0 in. (15.24 cm).
- The vertical mounting rails are plated or some other method is used to ensure continuity for grounding between installed equipment.
- Cable management brackets are provided to support and constrain data and power cords so that the cables do not interfere with air flow out of the rear of the enclosures, and so that the connectors do not disconnect or break.
- The cabinet provides enough stability so that system components pass Telcordia® GR-63-CORE Section 5.4.2 regulations for operational vibration.

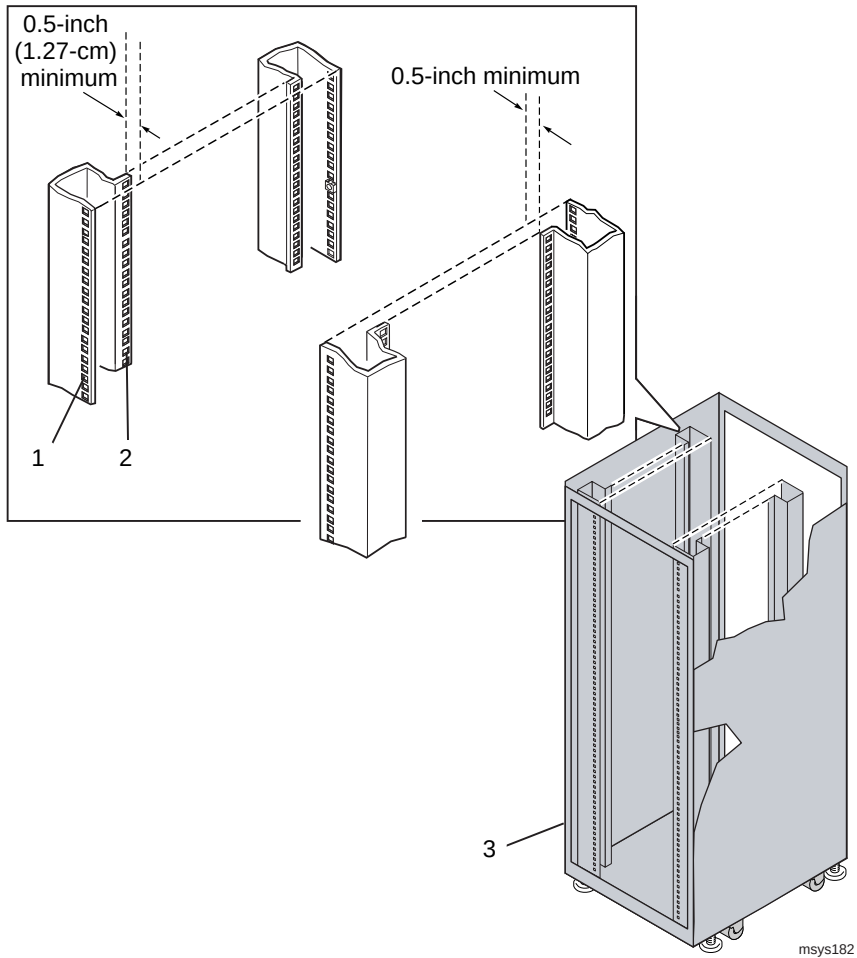
- To prevent stray voltages, all components are grounded together through the vertical mounting rails to the cabinet frame, and then to local building ground. To ensure signal quality, use a grounding cable provided by NEC Solutions (America), Inc. for local building ground.
- There is a plan for maintaining cables and wires to the cabinet by either running them under the floor or placing them overhead in an overhead cable tray.
- Air flows through the cabinet from front to back.
- Filler panels cover any unused rack space to prevent air recirculation.
- Vents are evenly distributed on the front and rear doors and comprise at least 63% of the surface area.

NOTE _____

If your cabinet does not have vented front and rear doors, you can remove the doors from the cabinet while your Express5800/320Ma 3.2 GHz or 3.6 GHz system is operating.

[Figure 2-1](#) shows the required rail clearance between the front vertical rails and the inside edge of an accessory leg.

Figure 2-1. Rail Clearance



- 1 Front vertical EIA rail
- 2 Accessory leg
- 3 Front of cabinet

Monitor Requirements

If you are using a monitor that is not supplied by NEC Solutions (America), Inc., make sure that:

- The monitor accepts universal 100–240 VAC, 50/60 Hz power.
- The VGA cable has a 15-pin D-sub connector.
- The power cord for the monitor is long enough to reach the power source.
- The plug type on the power cord is compatible with the external power source at the site.

Use the keyboard and mouse provided by NEC Solutions (America), Inc..

Chapter 3

Space Planning

For information about planning sufficient space for your Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core system, see:

- [“Room Requirements” on page 3-1](#)
- [“Planning for Cables” on page 3-2](#)

Room Requirements

To ensure that the installation site provides a properly equipped, cooled, and sized environment, make sure that the site:

- Provides clearances for air circulation and servicing the system
Locate the front and rear of the system at least 2.5 ft (0.76m) away from walls and other obstructions.
- Maintains reasonable temperature and humidity levels and has a thermometer and humidistat to monitor room temperature and humidity
- Is as free of dust as possible
Dust buildup in the system can impede air circulation and heat transfer, causing components to become less reliable as the ambient temperature rises.
- Provides a table or desktop for external devices such as a telephone, keyboard, and mouse
- Provides cutouts in the floor for routing cables, if the site has an elevated floor



CAUTION

Do not place the system in an area of high electrostatic discharge. Static electricity may damage components.
Do not locate components near transformers or other electromagnetic devices.

See [Appendix A, “System Specifications”](#) for the dimensions of system components.

Planning for Cables

To accommodate cables from your Express5800/320Ma 3.2 GHz or 3.6 GHz system, make sure to provide:

- Two telephone lines:
 - One telephone line for use when calling for service
 - One telephone line for the ASN modem
- Ethernet jacks, switches, or hubs, as needed
- Two electrically separate grounded AC wall outlets, or a UPS and a wall outlet, within reach of the power cords from the system or PDUs and additional outlets for any components that do not connect to a PDU

Make sure that cables you plan to connect to the system are long enough to reach between the system and external components or connections. S

Chapter 4

Electrical (AC) Power Planning

For information about planning appropriate AC electrical power for your Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core system, see:

- [“Redundant Power Sources” on page 4-1](#)
- [“AC Power Service Requirements” on page 4-2](#)
- [“Power Outlet Requirements” on page 4-4](#)
- [“Connecting a System Directly to Two Separate Power Sources” on page 4-5](#)
- [“NEC-Supplied Power Cords” on page 4-6](#)

Related Topics

- [Chapter 5, “UPS Planning”](#)
- [Chapter 7, “Rack Configuration Planning”](#)

Redundant Power Sources

Express5800/320Ma 3.2 GHz, 3.6 GHz, and Dual-Core systems require at least two separate and independent AC power sources—an *A-side* power source and a *B-side* power source—that provide power to the system’s power receptacles, labeled, respectively, A and B. Either source must be capable of continuing to provide power if power to the other source is lost.

The A-side power source provides power to components that do not require two sources of power: a KVM switch. If you use an uninterruptible power supply (UPS), the UPS is the A-side power source.

The B-side power source provides power to the other side of each system.

The wattage required from the A-side power source will always be equal to or greater than the wattage required from the B-side power source.

AC Power Service Requirements

[Table 4-1](#) describes the nominal input line voltage (volts AC) and frequency (Hz) required for your system and optional components. The table also provides a reference to a table that lists the receptacles to provide for each component.

Table 4-1. AC Power Service Requirements

Component	Nominal Input Voltage; Nominal Frequency Range	Receptacle
Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core system	100–240V; 50/60 Hz	See Table 4-9 .
PDU	200–240V; 50/60 Hz	See Table 4-11 .
KVM switch	100–240V; 50/60 Hz	See Table 4-13 .

The power service must be properly wired and grounded according to local standards and regulations. See [Appendix B](#) for electrical circuit and wiring information.

NOTE _____

Circuit breakers must provide a protective earth ground current at a maximum of 3.5 milliamperes for each AC power cord.

Use the following worksheets to determine AC power requirements for the site.

- In [Table 4-2](#), determine the power requirements at the A-side power source.
- In [Table 4-3](#), determine the power requirements at the B-side power source.
- In [Table 4-4](#), determine the power requirements for components outside of the cabinet. These components can share a power source with the A-side or B-side components.

To determine power requirements

Provide information in [Tables 4-2](#), [4-3](#), and [4-4](#) as follows:

1. In the Quantity column, write the number of each type of component.
2. Multiply the entry in the Quantity column by the number in the @ Power (Watts) column, and enter the result in the AC Power (Extended) column.
3. Add the values in the AC Power (Extended) column, and enter the sum on the bottom line. This value indicates the maximum power requirement for each power source.

Table 4-2. Worksheet for Determining A-Side Power Requirements

System Component	Quantity		@ Power (Watts)		AC Power (Extended)
Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core system		x	650	=	
KVM switch		x	20	=	
TOTAL A-SIDE POWER REQUIREMENTS					

Table 4-3. Worksheet for Determining B-Side Power Requirements

System Component	Quantity		@ Power (Watts)		AC Power (Extended)
Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core system		x	650	=	
TOTAL B-SIDE POWER REQUIREMENTS					

Table 4-4. Worksheet for Determining External Power Requirements

System Component	Quantity		@ Power (Watts)		AC Power (Extended)
Other external components					
TOTAL EXTERNAL POWER REQUIREMENTS					

Power Outlet Requirements

If you **do** use a pair of PDUs in the cabinet, use Tables 4-5 and 4-6 to determine the total number of power outlets required **outside the cabinet**.

1. In the Quantity column, write the number of each type of component.
2. Multiply the value in the Quantity column by the value in the Outlets column, and enter the total in the Subtotal column.
3. Add the values in the Subtotal column and enter the sum next to TOTAL NUMBER OF A-SIDE POWER OUTLETS and TOTAL NUMBER OF B-SIDE POWER OUTLETS.

Table 4-5. Worksheet: A-Side External Power Outlet Requirements - PDUs Used

Component	Quantity		Outlets	Subtotal
PDUs		x	1	
Other external components				
TOTAL NUMBER OF A-SIDE POWER OUTLETS				

Table 4-6. Worksheet: B-Side External Power Outlet Requirements - PDUs Used

Component	Quantity		Outlets	Subtotal
PDUs		x	1	
Other external components				
TOTAL NUMBER OF B-SIDE POWER OUTLETS				

If you do **not** use PDUs in the cabinet, use Tables 4-7 and 4-8 to determine the number of power outlets required **outside the cabinet**.

1. In the Quantity column, write the number of each type of component.
2. Multiply the value in the Quantity column by the value in the Outlets column, and enter the total in the Subtotal column.
3. Add the values in the Subtotal column and enter the sum next to TOTAL NUMBER OF A-SIDE POWER OUTLETS and TOTAL NUMBER OF B-SIDE POWER OUTLETS.

Table 4-7. Worksheet: A-Side External Power Outlet Requirements - No PDUs

Component	Quantity		Outlets	Subtotal
Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core systems+		x	1	
TOTAL NUMBER OF A-SIDE POWER OUTLETS				

Table 4-8. Worksheet: B-Side External Power Outlet Requirements - No PDUs

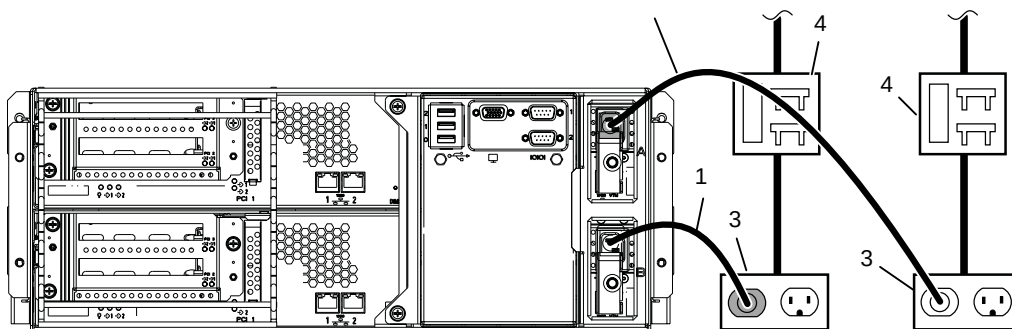
Component	Quantity		Outlets	Subtotal
Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core systems		x	1	
TOTAL NUMBER OF B-SIDE POWER OUTLETS				

Connecting a System Directly to Two Separate Power Sources

If you do not connect your Express5800/320Ma 3.2 GHz or 3.6 GHz system or PDUs to a UPS, provide two AC power sources that are as electrically independent of each other as the installation site allows. At a minimum, the two power sources must be powered by separate circuit breakers (maximum of 20A) to AC power and, if possible, be independent of each other beyond that level. The more electrical separation between the two power sources, the less likely they will both fail at the same time. Due to redundancy in Express5800/320Ma 3.2 GHz and 3.6 GHz systems, power to either side of the system keeps the system in operation, although the system is no longer fault-tolerant with regard to power.

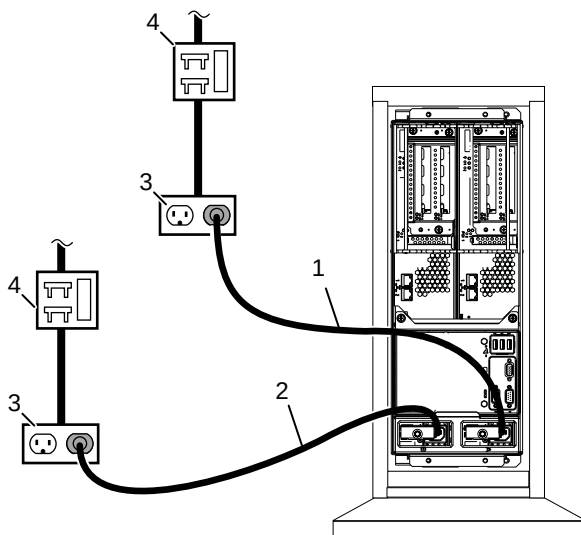
[Figure 4-1](#) shows how to connect a rack-mounted Express5800/320Ma 3.2 GHz, 3.6GHz, or Dual-Core system directly to two separate AC power sources, and [Figure 4-2](#) shows how to connect a pedestal system directly to two separate power sources.

Figure 4-1. Rack-Mounted System Connected Directly to AC Power



asys001

Figure 4-2. Pedestal System Connected Directly to AC Power



asys002

- 1 A-side system power cord
- 2 B-side system power cord
- 3 AC power outlets
- 4 Circuit breakers (maximum of 20A)

NEC-Supplied Power Cords

NEC Solutions (America), Inc. supplies power cords for:

- [Express5800/320Ma 3.2 GHz, 3.6 GHz, and Dual-Core systems](#)
- [PDUs](#)
- [KVM switches](#)



WARNING

Place all power cords out of the way of foot traffic.

Power cords described as Domestic are made with American Wire Gauge (AWG) cordage and are intended for use in North America. Refer to UL 62 and CSA C22.2, No. 49.

Power cords described as International are made with International Harmonized cordage and are intended for use outside of North America.

System Power Cords

[Table 4-9](#) lists the available power cords for Express5800/320Ma 3.2 GHz, 3.6 GHz, and Dual-Core systems that connect directly to an AC power source (not to a PDU or to a UPS).

[Table 4-10](#) lists the available power cords that connect Express5800/320Ma 3.2 GHz, 3.6 GHz, and Dual-Core systems to [qualified UPS models](#) from American Power Conversion (APC).

Table 4-9. System Power Cords to AC Power

Locale	Plug Type	Rating	Length	Marketing ID
North America and Japan locking power cord	NEMA L6-20	20A/250V	15 ft (4.5m)	B50161
International, locking power cord	IEC 60309 (formerly IEC 309)	16A/250V	4.5m	B50153
North America (Chicago)	NEMA 5-15	15A/127V	7 ft	B50101
North America (domestic)	NEMA 5-15	15A/127V	15 ft	B50104
Australia	AS/NZS 3112:1993	10A/250V	4.5m	B50124
China	GB1002-1996	10A/250V	4.5m	B50162
Europe (Continental)	CEE 7 VII	16A/250V	4.5m	B50112
Israel	SI 32:1971	16A/250V	4.5m	B50132
Italy	CEI23-16	10A/250V	4.5m	B50136

Table 4-9. System Power Cords to AC Power (Continued)

Locale	Plug Type	Rating	Length	Marketing ID
Japan	NEMA 5-15	15A/127V	15 ft (4.5m)	B50160
South Africa/India	SABS164-1:1992 ZA/3	13A/250V	4.5m	B50152
Switzerland	SEV 1011-S24507	10A/250V	4.5m	B50140
United Kingdom	BS 1363/A,	13A/250V	4.5m	B50116

Table 4-10. Systems: Power Cords to a UPS

Locale	Voltage Rating	Plug Types	Length	Marketing ID
North America (Chicago) and Japan	120V	NEMA 5-15 to IEC 60320 (formerly 320) C13	15 ft (4.5m)	B50104
North America (Domestic) and Japan	250V	NEMA L6-20 to IEC 60320 C13	15 ft (4.5m)	B50161
International	250V	IEC 320 C14 to IEC 60320 C13	3.5m	B50301

PDU Power Cords

The AA-P41104 PDU supplies power to Express5800/320Ma 3.2 GHz, 3.6 GHz, and Dual-Core systems. [Table 4-11](#) lists the available power cords to connect PDUs directly to an AC power source or to the APC® Smart-UPS® and APC Symmetra® UPS models.

[Table 4-12](#) describes the gray and black power (*jumper*) cables that are provided to connect Express5800/320Ma 3.2 GHz, 3.6 GHz, and Dual-Core systems to PDUs.

Table 4-11. PDU Power Cords to AC Power

Locale	Plug Type	Rating	Length	Marketing ID
North America and Japan [†]	IEC 60320 (formerly 320) C19 to NEMA L6-20P	20A/250V 50–60 Hz	15 ft (4.5m)	B50155
North America	IEC 60320 C19 to NEMA L6-30P (Receptacle must be fused at no more than 20A)	30A/250V 50–60 Hz	15 ft	B50156
International [†]	IEC 60320 C19 to IEC 60309	20A/250V 50–60 Hz	15 ft (4.5m)	B50154

[†] Use this power cord to connect the PDU directly to the AC power mains or to a UPS.

Table 4-12. System Power (*Jumper*) Cables to a PDU

Length	Rating	Plug Type to System	Plug Type to PDU	Marketing ID
2.0m	10A/250V	IEC 320 C13	IEC 60320 (formerly IEC 320) C14	B50502

Power Cords for Optional Components

[Table 4-13](#) lists the available power cords to connect to KVM switches directly to external AC power sources.

Table 4-13. Power Cords for Optional Components

Locale	Rating	Plug Type	Length	Marketing ID
North America and Japan	15A/120V	NEMA 5-15	7 ft	B501-01
North America and Japan	15A/120V	NEMA 5-15	10 ft	B501-02
United States (Domestic)	15A/127V	NEMA 5-15	10 ft	B501-06
Australia	10A/250V	AS/NZS 3112:1993	2.5m	B501-21
China (CCC)	10A/250V	GB1002-1996	2.5m	B50162-8F
Europe (Continental)	16A/250V	CEE 7 VII	2.5m	B501-09
India	13A/250V	SABS164-1:1992; ZA/3	2.5m	B501-49
Israel	16A/250V	SI 32:1971	2.5m	B501-29
Italy	16A/250V	CEI23-16;	2.5m	B501-33

Table 4-13. Power Cords for Optional Components *(Continued)*

Locale	Rating	Plug Type	Length	Marketing ID
New Zealand	10A/250V	AS/NZS 3112:1993	2.5m	B501-21
South Africa	13A/250V	SABS164-1:1992; ZA/3	2.5m	B501-49
Switzerland	10A/250V	SEV 1011-S24507	2.5m	B501-37
United Kingdom	13A/250V	BS1363/A	2.5m	B501-13

Chapter 5

UPS Planning

For information about planning for an uninterruptible power supply (UPS) to use with your Express5800/320Ma 3.2 GHz, 3.6 GHz, and Dual-Core system, see:

- [“Qualified APC UPS Models” on page 5-1](#)
- [“Communicating with a UPS over a Network” on page 5-2](#)
- [“Connecting Power to Systems, PDUs, and a UPS” on page 5-3](#)
- [“Connecting a System Directly to a UPS” on page 5-4](#)

Qualified APC UPS Models

NEC Solutions (America), Inc. has qualified certain UPS models from American Power Conversion Corporation (APC) for use with Express5800/320Ma 3.2 GHz, 3.6 GHz, and Dual-Core systems. The qualified APC Symmetra and APC Smart-UPS models are listed in Tables [5-1](#), [5-2](#), and [5-3](#).

NOTE

Site planning information for the UPS, which you must supply, is of a general nature only. Do not rely exclusively on the UPS information in this document. [Contact APC](#) at <http://www.apcc.com> for detailed UPS specifications, documentation, and ordering information.

Table 5-1. APC Symmetra Models for PDUs or for Multiple Systems

Locale	APC Symmetra Model	AC Power Input	AC Power Output
North America	SYH2K6RMT-P1, SYH4K6RMT-P1, SYH6K6RMT-P1, SYA8K16RMP, or SYA12K16RMP With SYA8K16RMP and SYA12K16RMP, also order AP7582, a rack PDU extender.	120V	120V or 208V

Table 5-1. APC Symmetra Models for PDUs or for Multiple Systems

Locale	APC Symmetra Model	AC Power Input	AC Power Output
Japan	SYH2K6RMJ-P1, SYH4K6RMJ-P1, or SYH6K6RMJ-P1	100V	100V or 200V
Rest of the world	SYK2K6RMI, SYK4K6RMI, SYK6K6RMI, SYA8K16RMI, or SYA12K16RMI	230V	230V or 240V

Table 5-2. APC UPS Models for a Single Rack-Mountable System

Locale	Smart-UPS	AC Power Input	AC Power Output
North America	Model SUA1500RM2U	120V	120V
Japan	Model SUA1500RMJ2U	80V to 123V	100V
Rest of the world	Model SUA1500RMI2U	160V to 286V	120V or 208V

Table 5-3. APC UPS Models for a Single Pedestal System

Locale	Smart-UPS	AC Power Input	AC Power Output
North America	Model SUA1500	120V	120V or 208V
Japan	Model SUA1500J	80V to 123V	100V
Rest of the world	Model SUA1500I	160V to 286V	230V or 240V

Communicating with a UPS over a Network

Use the following additional tools to enable an Express5800/320Ma system and a UPS to communicate over the network:

- APC Network Management Card EX (APC part number AP9617)
An APC Network Management Card EX is a standard component of the Symmetra UPS, but you must purchase the network card for the APC Smart-UPS.
- APC PowerChute[®] Network Shutdown for the Express5800/320Ma system

When you install your Express5800/320Ma system, download PowerChute Network Shutdown from APC, and install and configure the tool on the system, as described in the *Express5800/320Ma: Software Installation and Configuration Guide*. PowerChute Network Shutdown monitors the UPS for an imminent power loss, and initiates a shutdown of the system before power is lost.

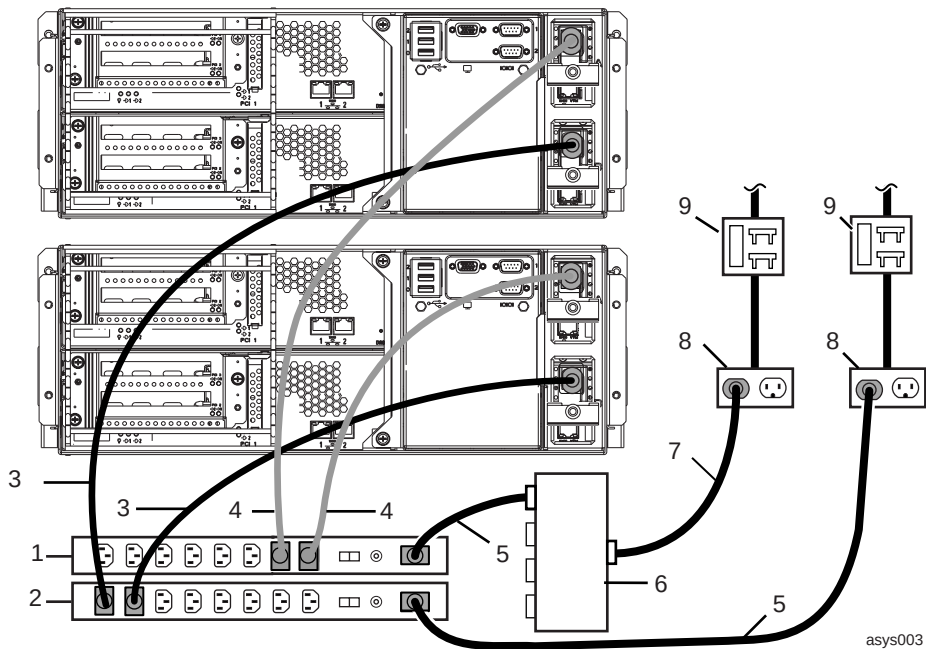
Connecting Power to Systems, PDUs, and a UPS

When you plan for PDUs, note the following:

- Only the top PDU is connected to the UPS.
- The bottom PDU is connected directly to an AC power main.
- The UPS can be connected to the same AC power main that the bottom PDU is connected to, or the UPS can be connected to another AC power main.

Figure 5-1 shows how to connect systems to PDUs and a UPS to the top PDU.

Figure 5-1. Power Cord Connections for Systems, PDUs, and a UPS



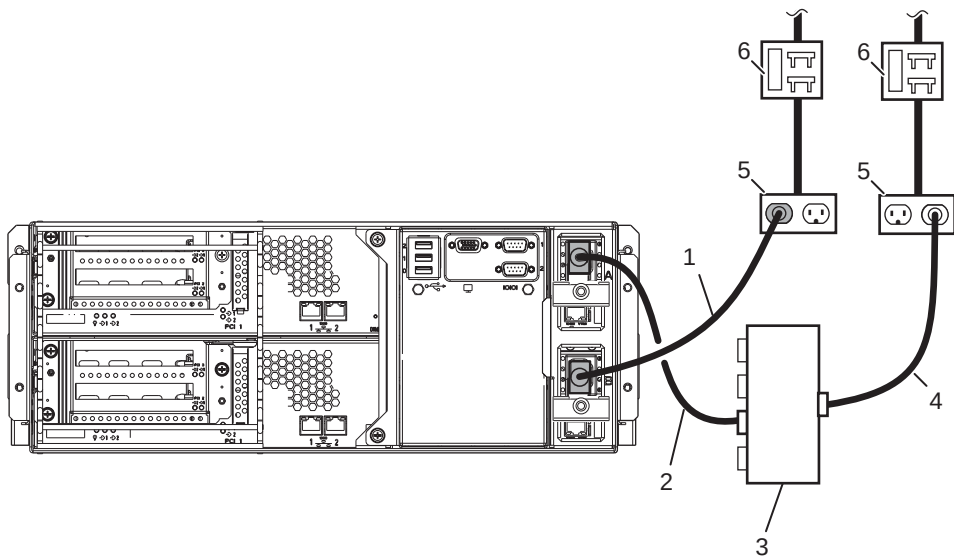
asys003

- 9 AC power (mains) distribution circuit breaker (maximum of 20A)

Connecting a System Directly to a UPS

You can connect the A-side power connectors of your system directly to a UPS, as shown in [Figure 5-3](#).

Figure 5-2. Rack-Mountable Systems: A-Side Power Connected Directly to a UPS

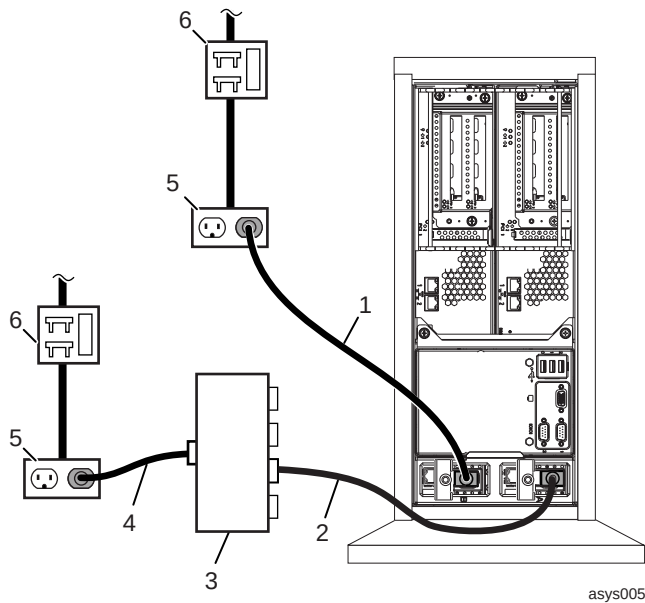


asys004

- 1 B-side system power cord
- 2 A-side system power cord
- 3 UPS
- 4 UPS power cord
- 5 AC power outlets
- 6 Circuit breakers (maximum of 20A)

Figure 5-3 shows how to connect a UPS to pedestal Express5800/320Ma 3.2 GHz and 3.6 GHz systems.

Figure 5-3. Pedestal Systems: A-Side Power Connected Directly to a UPS



- 1 B-side system power cord
- 2 A-side system power cord
- 3 UPS
- 4 UPS power cord
- 5 AC power outlets
- 6 Circuit breakers (maximum of 20A)

Chapter 6

Network and Telephone Line Planning

For information about planning network and telephone lines for your Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core system, see:

- “Network Cable Requirements” on page 6-1
- “Telephone Line Requirements” on page 6-2
- “Site Planning for Systems in an ftGateway Group” on page 6-3

Network Cable Requirements

Ethernet PCI adapters are typically supplied in pairs and teamed in software for fault tolerance. Each member of the pair requires a cable.



WARNING

Make sure Ethernet cables can be routed out of the way of foot traffic.

[Table 6-1](#) describes the Ethernet cables you must supply. Be sure to provide a cable of sufficient length for the distance between the system and a wall jack or hub.

NOTE

See the *Express5800/320Ma: PCI Adapter Guide* for more information about the adapters NEC Solutions (America), Inc. supplies for your Express5800/320Ma system.

Table 6-1. Customer-Supplied Ethernet Cables

Component	Quantity	Cable
VTM Ethernet port [†]	2	24 AWG Unshielded Twisted Pair (UTP) EIA/TIA-Verified, Category-3 or Category-5 wire, with RJ-45 modular connectors terminated with pair-wiring adhering to the EIA/TIA 568-A or EIA/TIA 568-B standard. For connections to an Ethernet hub or switch, provide a straight-through cable. For 100- or 1000-Mbps (fast Ethernet) operation, provide full-duplex, or Category-5 Ethernet cables. The maximum allowable distance from an Ethernet port to a switch or a hub is 100 meters (328 ft).
10/100/1000-Mbps system Ethernet port	2 or 4	
Dual-port 10/100/1000Base-T Ethernet PCI Adapter (gigabit copper adapter for servers)	2 for each pair of 10/100/1000Base-T Ethernet ports	
Dual-port 1000Base-SX Ethernet PCI Adapter (gigabit fiber-optic adapter for servers)	2 for each pair of 1000Base-SX Ethernet ports	Multimode, 62.5- or 50-micron, DUAL fiber cable with LC-type connectors to the PCI adapter, and connectors on the other end that are compatible with the network switch. The maximum distance between the U574 PCI adapter and a switch is 902 ft (275m).

[†] Some systems may not contain Virtual Technician Modules (VTMs), a system management module that provides remote access to and management of the system.

Telephone Line Requirements

Generally, two telephone lines are required to ensure technical support for your Express5800/320Ma 3.2 GHz or 3.6 GHz system:

- One telephone line for use when calling for service
- One analog telephone connection point for the modem

A 7-ft (2.13m) telephone cable, part number AW-B20245, is shipped with the modem assembly.

NOTES _____

1. If you implement ftGateway groups, you do not need to supply telephone connection points for each system. See [“Site Planning for Systems in an ftGateway Group”](#) for more information.

2. If your system will be configured with VTMs whose network ports are connected to a network with Internet access, your system will not have a modem installed for ASN support, and the second telephone line will not be necessary.
3. A dedicated phone line provides the most reliable service. ASN calls routed through a PBX might be slow due to the load on the PBX, or might not complete successfully because the calls can become disconnected. If you must use a PBX, do not route the telephone extension through a switchboard; instead, provide a direct-dial analog number.

Site Planning for Systems in an ftGateway Group

Multiple Express5800/320Ma systems at a site can share a single telephone connection to the ASN by implementing an *ftGateway group*. Unless VTMs are installed in each system, the systems in the group must be connected to a **single** physical Ethernet subnetwork. One system acts as a *gateway* for ASN connectivity. This gateway system requires an analog telephone line that connects to the modem. Other systems in the *gateway group*, called *gateway slaves*, connect to the gateway system over the network. In this case, Ethernet connections are required for each system, but only two analog telephone lines for each site are required.

Members of an ftGateway group:

- Are limited to a maximum of 20 Express5800/320Ma systems.
- Must connect to the same subnetwork through system Ethernet ports, ports of Ethernet adapters, or VTMs. An ftGateway group that contains Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core systems can consist of one of the following:
 - Slave systems with no remote management adapter in a group with an ftGateway system that has VTMs
 - Slave systems that have VTMs in a group with an ftGateway system that has VTMs

Using VTMs provides the highest level of manageability by allowing the system to be serviced even when the operating system is not operational.

NOTE

You cannot mix VTMs and ftServer Access Adapters in the same ftGateway group. ftServer Access Adapters are

system management adapters used in earlier models of Express5800/320Ma systems.

Make sure that only layer 1 and layer 2 devices separate the gateway and slave systems. During a connection, the gateway system assigns the slave system a temporary IP address from an IP address range reserved by NEC Solutions (America), Inc. and uses that address for all traffic.

Chapter 7

Rack Configuration Planning

For information about planning a rack configuration, see:

- [“Using PDUs” on page 7-1](#)
- [“Determining PDU Requirements” on page 7-2](#)
- [“Sample PDU Usage Calculation” on page 7-4](#)

Using PDUs

Express5800/320Ma 3.2 GHz, 3.6 GHz, and Dual-Core systems have two power receptacles. Correspondingly, two power distribution units (PDUs) provide power to the receptacles.

Use of PDUs is optional unless you have a support agreement with NEC Solutions (America), Inc. If you do have a support agreement with NEC Solutions (America), Inc., use pairs of PDUs to provide AC power to systems and components in a cabinet **if six or more power cords would otherwise exit from the cabinet.**

The A-side (top) PDU provides power to:

- The A-side of each system
- A KVM switch

The B-side (bottom) PDU provides power to the other side of each system.

Because the A-side PDU always uses at least as many power cords and consumes at least as much power as the B-side PDU, plan the cabinet configuration so that the A-side PDU can support the configuration.

NOTES

1. Connect each PDU to a separate AC power source.
2. Install a maximum of two pairs of PDUs in a rack.

Use the information in [“Determining PDU Requirements” on page 7-2](#) to plan the rack configuration for your Express5800/320Ma system. [“Sample PDU Usage Calculation” on page 7-4](#) shows how to use the information you gather for planning the rack configuration.

Determining PDU Requirements

Using the nominal voltage rating of the power receptacle at your site and the total wattage of the components that will draw power from the A-side PDU, complete the information in Tables [7-1](#) and [7-2](#). This information will help you determine the current that the Express5800/320Ma 3.2 GHz, 3.6 GHz, and Dual-Core systems and rack-mounted components will draw and whether you need a second pair of PDUs.

To complete [Table 7-1](#)

1. Obtain the voltage available at your location. Consult a facilities manager at your site to make sure you know the correct voltage.
2. For each type of component you plan to place in the rack, calculate the required current, as follows: Divide the wattage of the element, listed in the Watts column of [Table 7-1](#), by the voltage available at your site. Multiply the result by 1.25 and enter the value in the **Current** column.

Table 7-1. Current and Rack-Space Requirements

Component	Watts	Current	Rack Space
Express5800/320Ma 3.2 GHz, 3.6 GHz, and Dual-Core	650		4U
KVM switch	20		1U

To complete Table 7-2

1. In column 1, write the names of each system or component in the rack. If you have more than one system, use a row for each system.
2. In column 2, write the cumulative number of rack units (Us): Add the number of Us (see [Table 7-1](#)) for the component to the value in the space above and write the result.
3. In column 3, write the cumulative number of outlets required. For each component, add 1 to the value in the space above and write the result.
4. In column 4, write the cumulative current required. For each component, add the current for the component, which you entered in [Table 7-1](#), to the value in the space above and write the result.

You need another pair of PDUs if the cumulative number of outlets exceeds 8 or if the cumulative current exceeds 15A. Use the information in column 2 to plan the size and number of racks required.

Table 7-2. Calculating A-Side PDU and Rack-Space Requirements

1. Component	2. Cumulative Space Used	3. Cumulative Number of Outlets	4. Cumulative Current (A)
PDU Pair	2U	0	0.00

Sample PDU Usage Calculation

Table 7-3 shows how to use the information from Table 7-1 to calculate the current when the PDU is connected to a NEMA L6-20R receptacle in the United States, with a power voltage of 208V.

Table 7-3. Sample: Current and Rack-Space Requirements

Component	Watts	Current	Rack Space
Express5800/320Ma Dual-Core system	650	3.91A	4U
KVM switch	20	0.12	1U

Table 7-4 and the explanation which follows show how to use the information from Table 7-3 to determine when you need to buy an additional pair of PDUs or calculate the size and number of cabinets you need.

Table 7-4. Sample: Calculating A-Side PDU and Rack-Space Requirements

1. Component	2. Cumulative Space Used (U)	3. Cumulative Number of A-Side Outlets	4. Cumulative Current (A)
PDU pair	2	0	0.00
Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core system	6	1	3.91
KVM switch	8	3	4.15
Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core system	15	5	11.06
PDU pair	19	0	0
Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core system	23	1	3.91
Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core system	29	3	9.62

In this calculation, components were added one by one, calculating:

- The total current demanded by the components
- The total space used in the rack
- The total number of outlets required

In this example, two PDUs can provide enough current for the KVM switch, and two Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core system systems. This set of components occupies six outlets in the PDU and 17U of rack space.

To add any more components, you require another pair of PDUs.

Appendix A

System Specifications

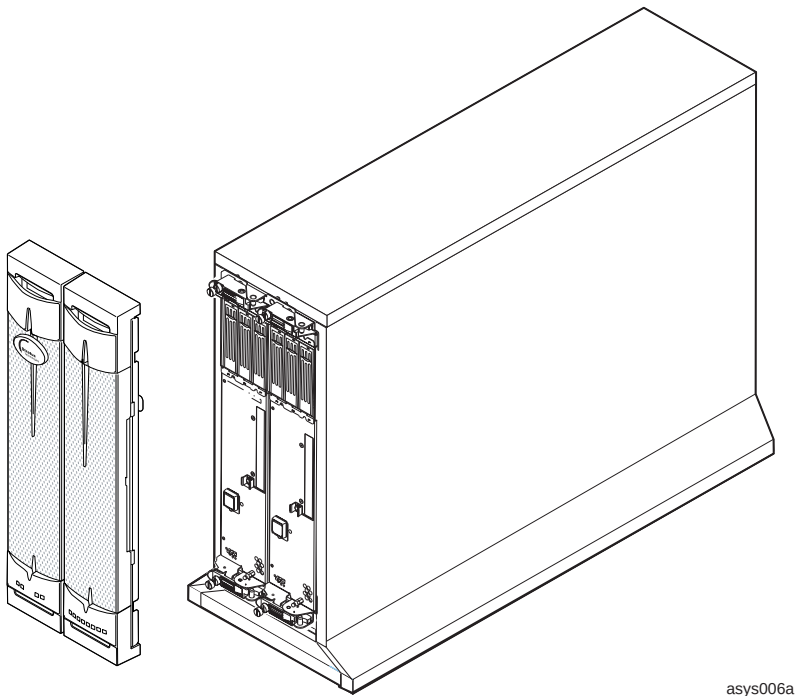
NOTE

The system temperature and humidity requirements, defined in [Table A-1](#) and [Table A-3](#) are the **minimum** requirements the site must provide.

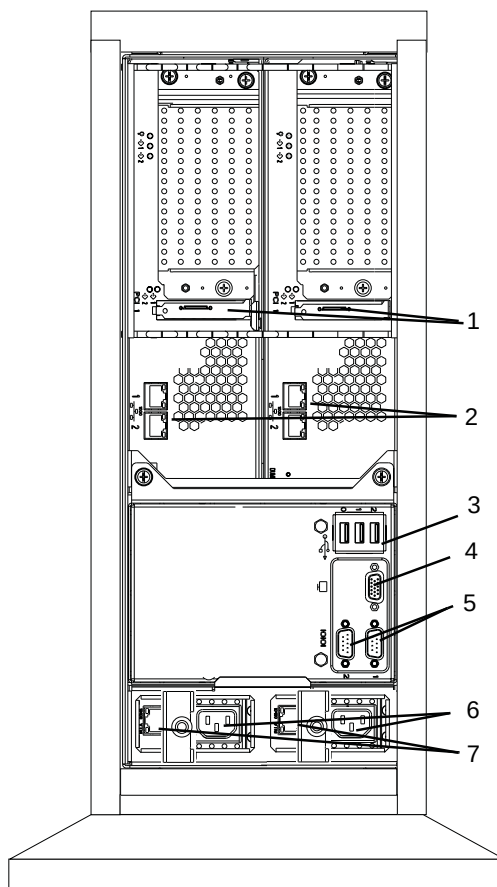
System Specifications

[Figure A-1](#) shows the front of a pedestal Express5800/320Ma 3.2 GHz or 3.6 GHz systems system, its bezel pulled forward. [Figure A-2](#) shows the rear of a typical pedestal Express5800/320Ma 3.2 GHz system, and [Figure A-3](#) shows the rear of a pedestal Express5800/320Ma 3.6 GHz systems, specifying the locations of the connectors at the back of the system. [Table A-1](#) lists specifications for the pedestal Express5800/320Ma 3.2 GHz, 3.6 GHz, and Dual-Core systems system.

Figure A-1. Pedestal System - Front View



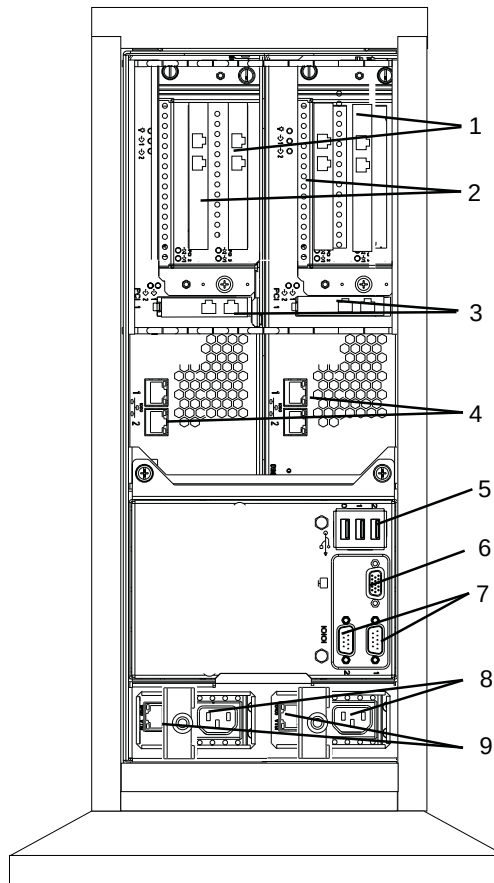
asys006a

Figure A-2. Pedestal Express5800/320Ma 3.2 GHz systems - Rear View

asys007

- 1 Ports on a PCI adapter in slot 1
- 2 System 10/100/1000-Mbps Ethernet ports (4)
- 3 USB ports (3)
- 4 VGA (monitor) port
- 5 Serial (COM) ports (2)
- 6 Power receptacles (2)
- 7 VTM 10/100-Mbps Ethernet port (2)

Figure A-3. Pedestal Express5800/320Ma 3.6 GHz systems- Rear View



asys008

- 1 PCI slot 3
- 2 PCI slot 2
- 3 PCI slot 1
- 4 System 10/100/1000-Mbps Ethernet ports (4)
- 5 USB ports (3)
- 6 VGA (monitor) port
- 7 Serial (COM) ports (2)
- 8 Power receptacles (2)
- 9 VTM 10/100-Mbps Ethernet ports (2)

Table A-1. Pedestal System Specifications

Power	
Input power	A-side enclosure: 650W B-side enclosure: 650W
Nominal input voltage (AC)	100-230 volts +/- 10% 240V + 6%/-10%; 50/60 Hz
Protective earth ground current	3.5 milliamperes maximum for each AC power cord
Physical Dimensions of System in a Pedestal Case	
Height	23.25 in. (59.05 cm.)
Width	8.62 in. (21.89 cm); 12.88 in. (32.72 cm)
Depth	31.38 in. (79.71 cm)
Weight, including 8 DIMMS, 4 processors, and 6 disks	Two enclosures: 110 lb (49.9 kg), fully loaded Case: 68 lb (30.84 kg)
Environmental	
Operating temperature	41°F to 95°F (5°C to 35°C) For every 800 ft (243.8m) above 2,000 ft (609.6m), lower the maximum operating temperature (35°C) by 1°C.
Storage temperature	-38° F to 140° F (-40° C to 60° C)
Operating altitude	0 ft to 10,000 ft (0m to 3,048m)
Maximum rate of temperature change during operation	18°F/hr (10°C/hr) or 0.30°F/min (0.17°C/min)
Relative humidity during operation	20% to 80% (noncondensing)
Relative humidity during storage	8% to 80%
Heat dissipation	4432 BTUs per hour

Table A-1. Pedestal System Specifications (Continued)

Features	
Processors	Express5800/320Ma 3.2 GHz systems: One or two Intel Xeon 3.2 GHz processors with Hyper-Threading Technology in each CPU-I/O enclosure Express5800/320Ma 3.6 GHz systems: Two Intel Xeon 3.6 GHz processors with Hyper-Threading Technology in each CPU-I/O enclosure Express5800/320Ma Dual-Core systems: Two Dual-Core Intel Xeon 2.8 GHz processors with Hyper-Threading Technology in each CPU-I/O enclosure
Memory	Eight physical dual data rate (DDR) inline memory module (DIMM) slots in each CPU-I/O enclosure
Ports	Four 10/100/1000-Mbps Ethernet ports Two AC power connectors, one VGA port, two serial ports, and three USB ports
PCI slots	Express5800/320Ma 3.2 GHz systems: One user-configurable, low-profile PCI adapter slot operating at 64-bits and 100 MHz in each CPU-I/O enclosure (you can add two full-height PCI adapter slots in each CPU-I/O enclosure with the optional AK533 riser assembly kit) Express5800/320Ma 3.6 GHz and Dual-Core systems: One low-profile PCI adapter slot and two full-height PCI adapter slots operating at 64-bits and 100 MHz, all user-configurable, in each CPU-I/O enclosure
VTM	Virtual Technician Module (VTM) The VTM is a system management module. When VTMs are installed, two 10/100-Mbps Ethernet ports dedicated to the VTMs are present.
Disk drives	Six Serial ATA (SATA) disk drives

Rack-Mountable System Specifications

Figure A-4 shows the front of a rack-mountable Express5800/320Ma 3.2 GHz, 3.6 GHz and Dual-Core system, mounted in a rack with its bezel pulled forward. The front views of the systems are identical. Figure A-5 shows the rear of a rack-mountable Express5800/320Ma 3.2 GHz system, and Figure A-6 shows the rear of a rack-mountable Express5800/320Ma 3.6 GHz or Dual-Core system, specifying the locations of the connectors at the back of the system. Table A-3 lists the specifications for the rack-mountable Express5800/320Ma 3.2 GHz, 3.6 GHz and Dual-Core system systems.

Figure A-4. Rack-Mountable System - Front View

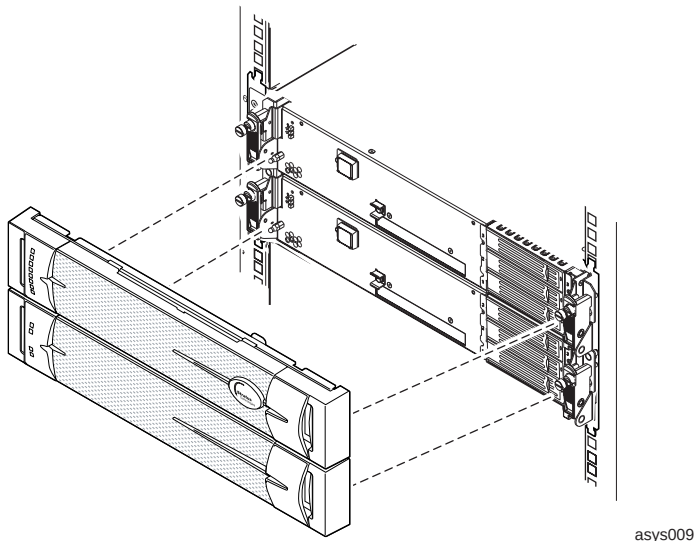
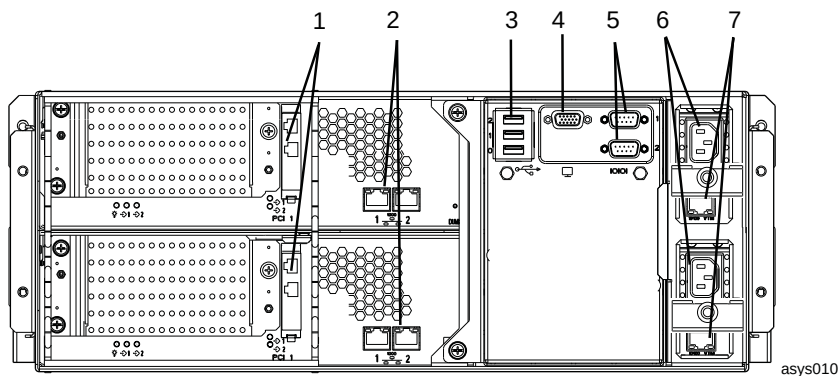
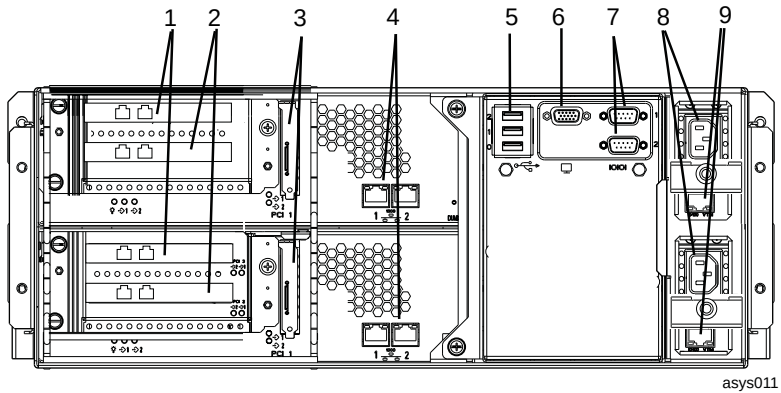


Figure A-5. Rack-Mountable Express5800/320Ma 3.2 GHz system - Rear View



- 1 PCI slot 1
- 2 System 10/100/1000-Mbps Ethernet ports (4)
- 3 USB ports (3)
- 4 VGA (monitor) port
- 5 Serial (COM) ports (2)
- 6 Power receptacles (2)
- 7 VTM 10/100-Mbps Ethernet ports (2)
- 8 Telephone cord port

Figure A-6. Rack-Mountable Express5800/320Ma 3.6 GHz or Dual-Core System - Rear View



- 1 PCI slot 3
- 2 PCI slot 2
- 3 PCI slot 1
- 4 System 10/100/1000-Mbps Ethernet ports (4)
- 5 USB ports (3)
- 6 VGA (monitor) port
- 7 Serial (COM) ports (2)
- 8 Power receptacles (2)
- 9 VTM 10/100-Mbps Ethernet ports (2)
- 10 Telephone cord port

Table A-2. Cabinet Dimensions

24U Shipping Container	
Height (including pallet)	56 in. (1.42m)
Width	41 in. (1.04m)
Depth	53 in. (1.35m)
38U Shipping Container	
Height (including pallet)	79.75 in. (2.03m)
Width	41 in. (1.04m)
Depth	53 in. (1.35m)
24U Cabinet	
Height (including casters)	50 in. (1.27m)
Width	27.5 in. (70 cm)
Depth	41 in. (1.04m)
Weight, empty	275 lb (125 kg)
Weight, empty with pallet and shipping container	436 lb (197.8 kg)
38U Cabinet	
Height (including casters)	74 in. (1.9m)
Width	27.5 in. (70 cm)
Depth	41 in. (1.04m)
Weight, empty	344 lb (156 kg)
Weight, empty with pallet and shipping container	512 lb (232.2 kg)

Table A-3. Rack-Mountable System Specifications

Power	
Input power	A-side enclosure: 650W B-side enclosure: 650W
Nominal input voltage (AC)	100-230 volts +/- 10% 240V + 6%/-10%; 50/60 Hz
Protective earth ground current	3.5 milliamperes maximum for each AC power cord
Physical Dimensions	
Height	7.0 in. (17.78 cm; 4U)
Width	17.50 in. (44.45 cm)
Depth	30 in. (76.2 cm), excluding screws and bezel
Weight, including 8 DIMMS, 4 processors, and 6 disks	Two enclosures: 110 lb (49.9 kg), fully loaded Rails and shelf unit: 13.8 lb (6.26 kg)
Environmental	
Operating temperature	41° F to 95° F (5° C to 35° C) For every 800 ft (243.8 m) above 2000 ft (609.6 m), lower the maximum operating temperature (35° C) by 1° C.
Storage temperature	-38° F to 140° F (-40° C to 60° C)
Operating altitude	0 ft to 10,000 ft (0m to 3,048m)
Maximum rate of temperature change during operation	18° F/hr (10° C/hr) or 0.30° F/min (0.17° C/min)
Relative humidity during operation	20% to 80% (noncondensing)
Relative humidity during storage	8% to 80%
Heat dissipation	4432 BTUs per hour

Table A-3. Rack-Mountable System Specifications *(Continued)*

Features	
Processors	Express5800/320Ma 3.2 GHz: One or two Intel Xeon 3.2 GHz processors with Hyper-Threading Technology in each CPU-I/O enclosure Express5800/320Ma 3.6 GHz: Two Intel Xeon 3.6 GHz processors with Hyper-Threading Technology in each CPU-I/O enclosure Express5800/320Ma Dual-Core: Two Dual-Core Intel Xeon 2.8 GHz processors with Hyper-Threading Technology in each CPU-I/O enclosure
Memory	Eight physical dual data rate (DDR) inline memory module (DIMM) slots in each CPU-I/O enclosure
Ports	Two 10/100/1000-Mbps Ethernet ports in each CPU-I/O enclosure Two AC power connectors, one VGA port, two serial ports, and three USB ports
PCI slots	Express5800/320Ma 3.2 GHz systems: One user-configurable, low-profile PCI adapter slot operating at 64-bits and 100 MHz in each CPU-I/O enclosure (you can add two full-height PCI adapter slots in each CPU-I/O enclosure with the optional AK533 riser assembly kit) Express5800/320Ma 3.6 GHz and Dual-Core systems: One low-profile PCI adapter slot and two full-height PCI adapter slots operating at 64-bits and 100 MHz, all user-configurable, in each CPU-I/O enclosure
VTM	A Virtual Technician Module (VTM), a system management module CPU-I/O enclosure When VTMs are installed, a 10/100-Mbps Ethernet ports dedicated to the VTM is present for each VTM.
Disk Drives	Three Serial ATA (SATA) disk drives in each CPU-I/O enclosure

Appendix B

Electrical Circuit and Wiring Information

For electrical circuit and wiring information that you need to provide to the contractor and/or facilities personnel responsible for wiring the power at the system installation site, see:

- [“Fault Protection Requirements” on page B-1](#)
- [“Grounding Considerations” on page B-1](#)
- [“Circuit Wiring Diagrams” on page B-3](#)
- [“Electrical Power Connectors” on page B-9](#)

Fault Protection Requirements

Each enclosure in Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core systems contains internal fault/overload current protection. However, the system relies on the power distribution system at your site for protection against potential faults in the power cords and the wiring in the system base.

- If you are using a pair of PDUs in the cabinet, use 30A or less circuit breakers in each power distribution branch that feeds the PDUs.
- To connect a single system to power, use 20A or less circuit breakers in each power distribution branch that feeds the systems.

Grounding Considerations

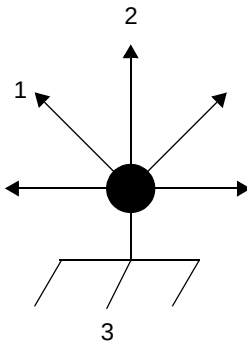
The system obtains an earth reference ground through the power cords attached to the system. Similarly, each peripheral device connected to the system obtains ground through its power cord. For each peripheral device, you **must** ensure that a high-integrity safety-ground conductor is installed as part of the wiring system (in accordance with U.S. national electric code NFPA 70 or the equivalent). The international safety standard (EN60950) for electronic data processing (EDP) equipment also requires a ground conductor, but calls it a protective earth (PE) ground.

Depending upon local conditions, ground potentials may differ between the system base and any peripheral devices connected to the system base. All grounds in the system **must** return to the same reference point in the power distribution system, as close as possible to **zero (0) volt potential** relative to earth reference ground. Earth

reference ground is typically a metal stake in the ground to which the ground conductors from one or more buildings are attached.

As shown in [Figure B-1](#), a *star ground* is often used to obtain the same earth reference ground. Each earth reference ground, such as the system base ground, is returned separately to a common point where a zero-volt (0V) earth ground exists. The star ground ensures that all equipment is at the same potential and that no noise or safety problems associated with an unpredictable or uncharacterized grounding system will occur.

Figure B-1. Star Ground Example



- 1 To monitor
- 2 To Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core system
- 3 Earth reference ground (0V)

Circuit Wiring Diagrams

The following circuit wiring diagrams show how the hot, ground, and/or neutral AC signals should be connected to the system's power input plug:

- [Figure B-3](#) illustrates a single-phase 120-volts AC circuit connection.
- [Figure B-4](#) illustrates a single-phase 240-volts AC circuit connection.
- [Figure B-5](#) illustrates a split-phase 120/240-volts AC circuit connection.
- [Figure B-6](#) illustrates a three-phase 208-volts AC, Y-, or Δ -source circuit connection, phase-to-neutral.
- [Figure B-7](#) illustrates a three-phase 208-volts AC, Y-, or Δ -source circuit connection, phase-to-phase.
- [Figure B-8](#) illustrates a three-phase 380V AC, Y-, or Δ -source circuit connection, phase-to-neutral.

In the diagrams in this appendix, the power inputs for Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core system are labeled X and Y, as shown in [Figure B-2](#), to eliminate any ambiguities in the nomenclature. For single-phase applications, the X input is connected to the L (Line) *hot* input, and the Y input is connected to the N (Neutral) input. However, for split-phase or three-phase applications, the X and Y inputs are connected to L1, L2, or L3 (separate lines). Therefore, for split-phase or three-phase applications, both X and Y can be electrically hot with respect to the system base (earth reference ground). [Figure B-2](#) shows the physical locations of the X and Y inputs on the system base.

Figure B-2. Power Input Labeling

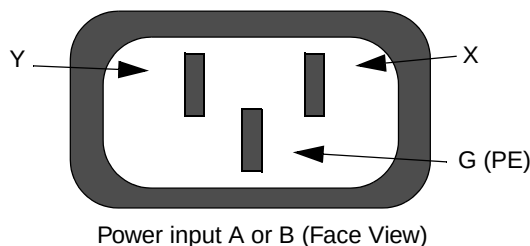


Figure B-3 shows a single-phase 120-volts AC circuit connection. Note that this application requires a single-pole circuit breaker.

Figure B-3. Single-Phase 120-Volts AC Circuit Connection

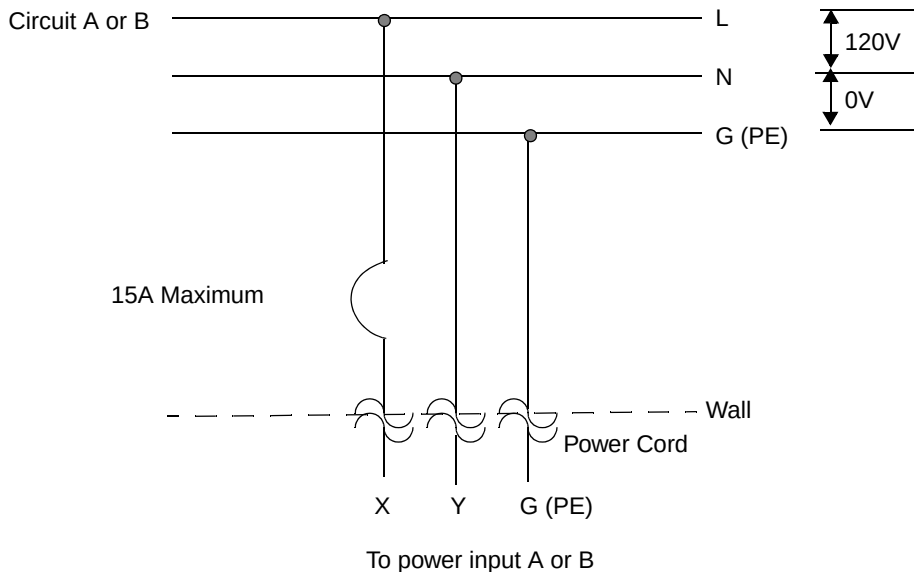


Figure B-4 shows a single-phase 240-volts AC circuit connection. Note that this application requires a single-pole circuit breaker.

Figure B-4. Single-Phase 240-Volts AC Circuit Connection

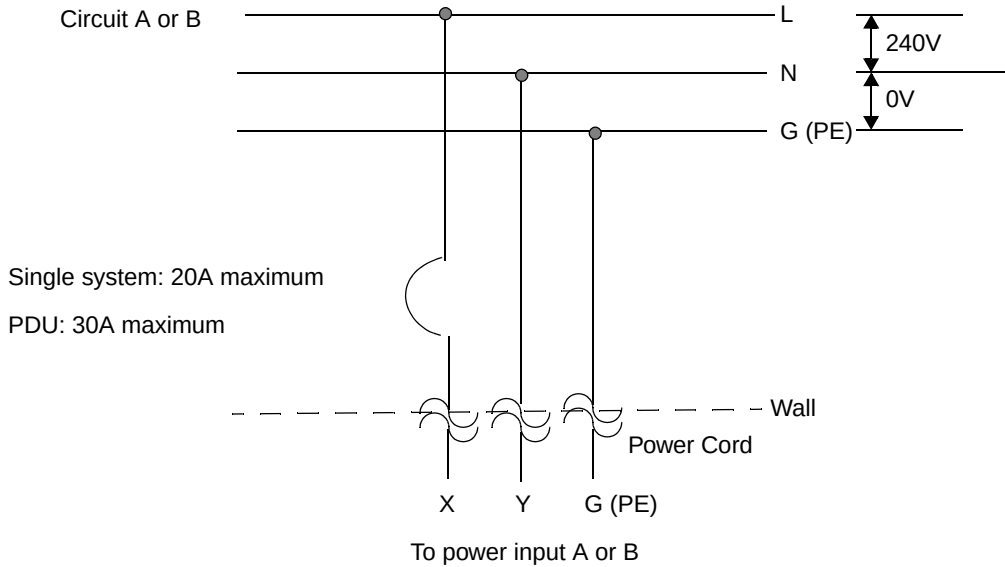


Figure B-5 shows a split-phase 120/240-volts AC circuit connection. Note that this application requires a double-pole circuit breaker.

Figure B-5. Split-Phase 120/240 Volts AC Circuit Connection

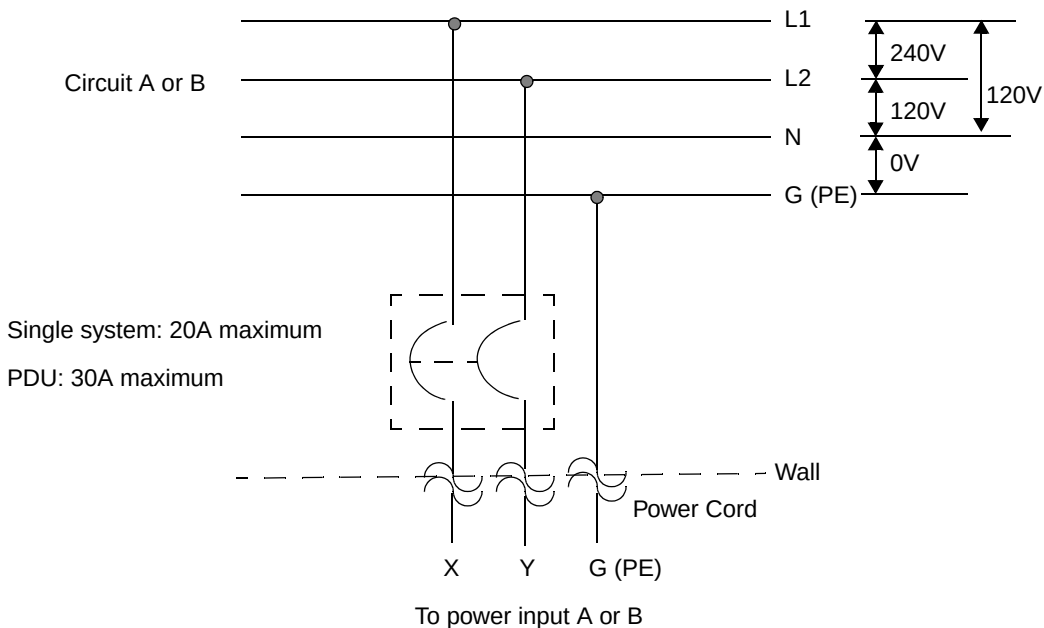


Figure B-6 shows a three-phase 208-volts AC, Y-, or Δ -source circuit connection, which is a phase-to-neutral source connection. Note that the X input on the system can be connected from L1, L2, or L3. This application requires a single-pole circuit breaker.

Figure B-6. Three-Phase 208-Volts AC, Y-, or Δ -Source Circuit Connection, Phase-to-Neutral

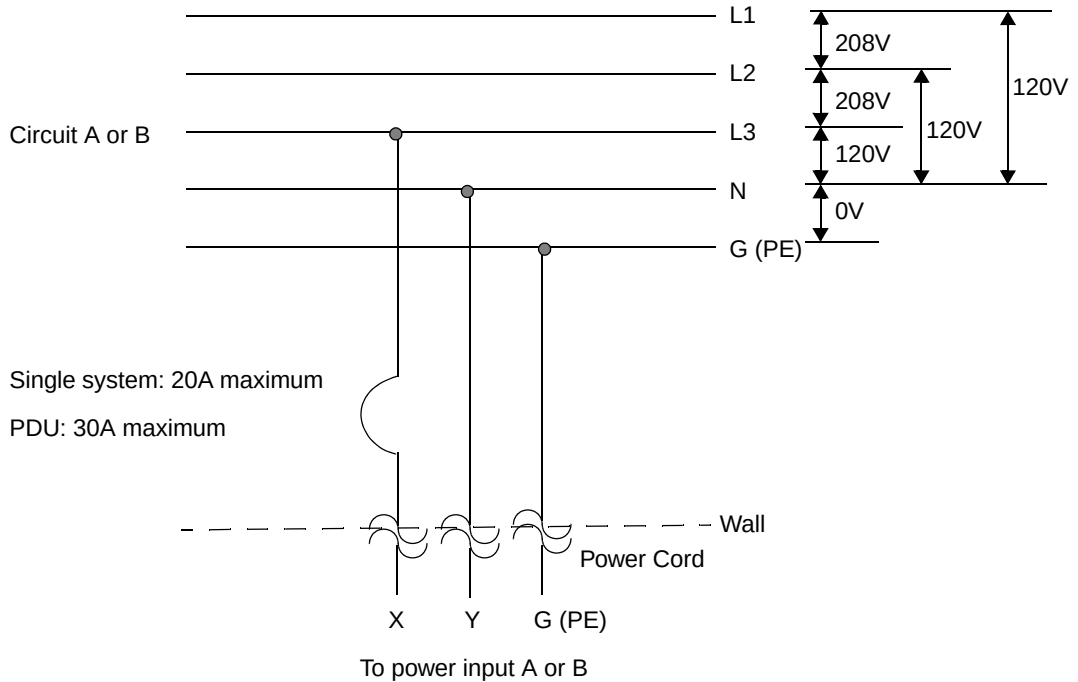


Figure B-7 shows a three-phase 208-volts AC, Y-, or Δ -source circuit connection, which is a phase-to-phase source connection. Note that the X and Y inputs on the system can be connected from L1 and L2, L2 and L3, or L1 and L3. This application requires a double-pole circuit breaker.

Figure B-7. Three-Phase 208-Volts AC, Y-, or Δ -Source Circuit Connection, Phase-to-Phase

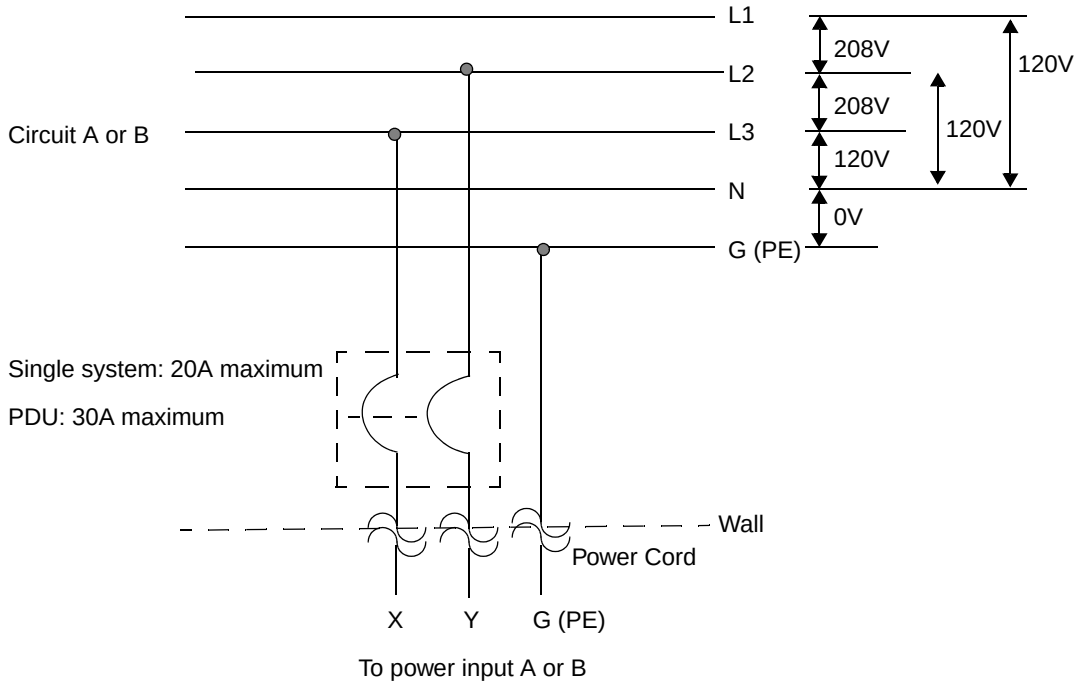
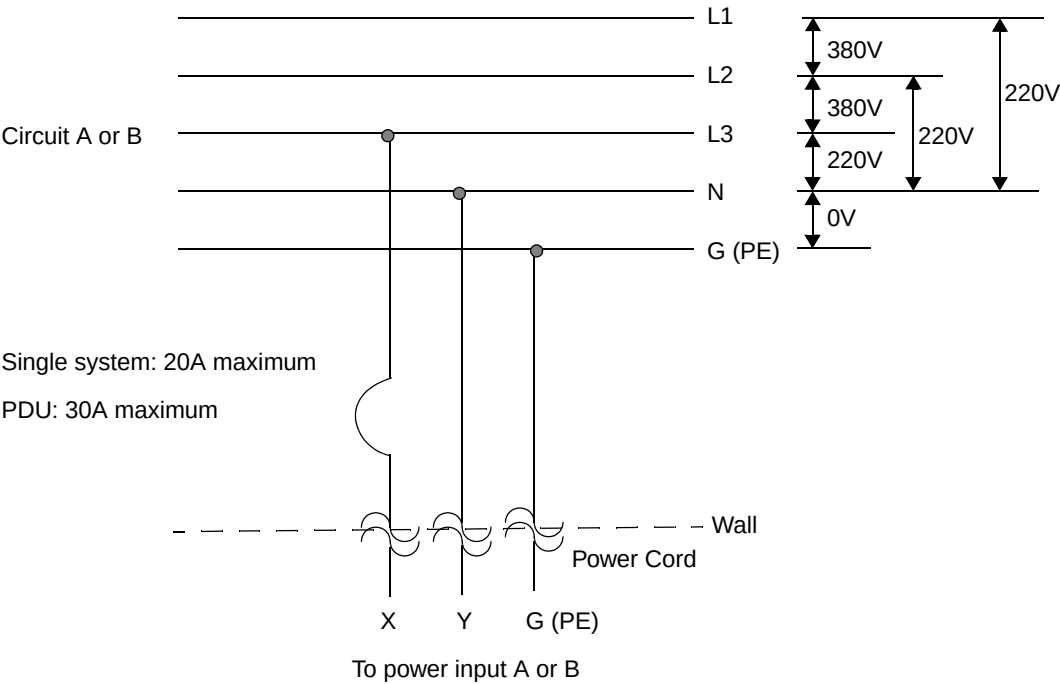


Figure B-8 shows a three-phase 380V AC, Y-, or Δ -source circuit connection, which is a phase-to-neutral source connection. Note that the system's X input can be connected to L1, L2, or L3. This application requires a single-pole circuit breaker.

Figure B-8. Three-Phase 380V AC, Y-, or Δ -Source Circuit Connection, Phase-to-Neutral



Electrical Power Connectors

Table B-1 describes the connectors that NEC Solutions (America), Inc. uses to connect Express5800/320Ma 3.2 GHz, 3.6 GHz, or Dual-Core system and peripheral devices to AC power outlets.

Table B-1. Connectors for AC Power Outlets

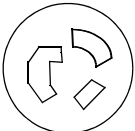
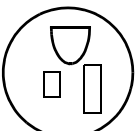
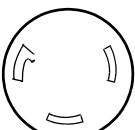
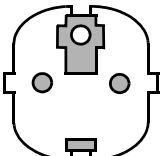
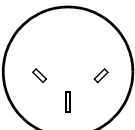
Connector	Configuration	Rating	Description
NEMA L6-20		20A, 250 volts AC	2-pole, 3-wire
NEMA 5-15		15A, 125 volts AC	2-pole, 3-wire
NEMA L6-30		30A, 250 volts AC	2-pole, 3-wire
CEE (7) VII		20A, 250 volts AC	2-pole, 3-wire
CEI-23-16		16A, 250 volts AC	2-pole, 3-wire
SI 32/1971		16A, 250 volts AC	2-pole, 3-wire

Table B-1. Connectors for AC Power Outlets (Continued)

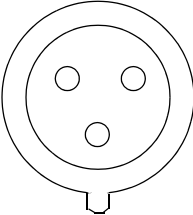
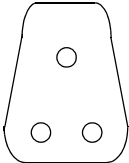
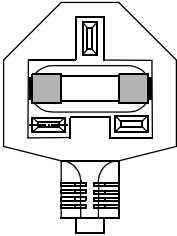
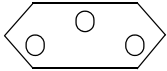
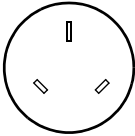
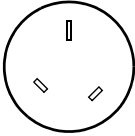
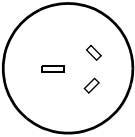
Connector	Configuration	Rating	Description
IEC 60309 (formerly IEC 309)		16-20A, 250 volts AC	2-pole, 3-wire
SABS 164-1:1992		16A, 250 volts AC	2-pole, 3-wire
BS 1363/A		13A, 250 volts AC	2-pole, 3-wire
SEV 1011-S24507		10A, 250 volts AC	2-pole, 3-wire
AS/NZS 3112-1993		15A, 250 volts AC	2-pole, 3-wire
SAA/3/15 AS/NZS 3112-1993		15A, 250 volts AC	2-pole, 3-wire

Table B-1. Connectors for AC Power Outlets *(Continued)*

Connector	Configuration	Rating	Description
GB1002-1996		10A, 250 volts AC	2 pole, 3-wire

Appendix C

Standards Compliance

Express5800/320Ma systems comply with the electromagnetic interference (EMI), immunity, safety, and noise regulations listed in Tables C-1 through C-4. All necessary agency labels are on the system.

NOTES _____

1. This system must be configured with the components listed and described in the product configuration specifications. Deviations from this list of components will void agency certification.
2. You must install all wiring, including power and communications cables, in compliance with local and national electrical code (in the United States, national electrical code NFPA 70). In addition, you must use shielded communications cables to remain in compliance with Federal Communications Commission (FCC) and other international Electromagnetic compatibility (EMC) regulations.
3. All EMC emissions compliance tests are performed at a third-party certified test laboratory. You can obtain compliance reports for these tests from your Express5800/320Ma account representative, who will contact the Product Compliance Group in the NEC Solutions (America), Inc. engineering organization.

Table C-1. EMI Standards

Standard	Description	Country/Region
FCC Part 15 Class A	Code of Federal Regulations 47 (1998) Class A	North America
EN 55022	Limits and methods of measurement of radio disturbance characteristics of Information Technology Equipment	European Union
AS/NZS 3548	Limits and methods of measurement of radio disturbance characteristics of Information Technology Equipment	Australia/New Zealand
CNS13438	Chinese National Standard 13438	Taiwan
VCCI Class A	Voluntary Control Council for Interference by Information Technology Equipment	Japan

Table C-2. Immunity Standards

Standard	Description	Country/Region
EN 50082-1	Generic Immunity Standard, Electromagnetic Compatibility, Residential, Commercial, and Light Industrial	European Union
EN 55024	Limits and methods of measurement of immunity characteristics of Information Technology Equipment	European Union

Table C-3. Safety Standards

Standard	Description	Country/Region
UL 60950	Safety of Information Technology Equipment	North America
EN 60950	Safety of Information Technology Equipment	European Union

Table C-4. Noise Standards

Standard	Description	Country/Region
ISO 9614-2	Acoustics. Determination of Sound Power Levels of Noise Source using Sound Intensity	European Union
ISO 7779	Measurements of Airborne Noise emitted by Computers and Business Equipment	European Union

VCCI Note

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

BSMI Note**警告使用者**

這是甲類的資訊產品、在居住的環境中使用時、可能會造成射頻干擾、在這種情況下、使用者會被要求採取某些適當適對策

Index

A

ActiveService Network (ASN). *See* ASN
AK533 riser assembly kit, A-6, A-12
American Power Conversion. *See* APC
APC
 Network Management Card EX, 5-2
 PowerChute Network Shutdown, 5-2
 qualified UPS, 5-1
AS/NZS 3112-1993 connector, B-11
A-side power source, 4-1
ASN, site planning, 1-2, 1-3, 3-2

B

BS 1363/A connector, B-11
B-side power source, 4-1

C

cabinets
 configuration planning, 7-1
 requirements, 2-1
 specifications, A-10
cables
 Ethernet network, 6-1
 planning for, 3-2
 supplied, 3-2
 telephone, 3-2
CEE (7) VII connector, B-10
CEI-23-16 connector, B-10
checklist for site planning, 1-2
circuit, electrical
 planning information, B-1
 wiring diagrams, B-3
compliance, standards, C-1
connectors (AC), B-9
cooling requirements, 3-1
 See also environmental requirements, 3-1

D

documentation, ordering, 1-6

E

earth reference ground, B-1
electrical connectors, B-9
electrical grounding, B-1
electrical wiring, B-1
electromagnetic interference, C-2
environmental requirements
 maximum rate of temperature
 change, A-5, A-11
 operating humidity, A-5, A-11
 operating temperature, A-5, A-11
 storage humidity, A-5, A-11
Ethernet network cables, 6-1

F

ftGateway, site planning information, 6-3

G

GB1002-1996 connector, B-12
grounding the system, 2-2, B-1

H

hubs, network, 3-2

I

IEC 309 connector, B-11
IEC 60309 connector, B-11
immunity regulations, C-2

J

jacks, Ethernet, 3-2

K

KVM switches
power service requirements, 4-2

M

monitors
power cords, 4-9
requirements, 2-4

N

NEC Technical Support, 1-2
NEMA 5-15 connector, B-10
NEMA L6-20 connector, B-10
NEMA L6-30 connector, B-10
network (Ethernet) cables, 6-1
noise regulations, C-2

P

power (AC)
cords
monitors, 4-9
storage enclosures, 4-9
systems, 4-7
electrical requirements, 4-2
PDU connections, illustrated, 5-3
service requirements, 4-2, 4-4, 4-5
A-side, 4-4
B-side, 4-4
sources, 4-1
sources, no UPS, 4-5
system connections, illustrated, 4-5, 4-6
UPS connections, illustrated, 5-4, 5-5
wall outlets, 3-2, 4-4
printed documentation, ordering, 1-6
protective earth ground, B-1

R

racks
requirements, 2-1
room requirements, 3-1

S

SAA/3/15 AS/NZS 3112-1993 connector, B-11
SABS 164-1:1992 connector, B-11
safety regulations, C-2

SEV 1011-S24507 connector, B-11
SI 32/1971 connector, B-10
single-phase circuit connections
120 V AC, B-4
240 V AC, B-5
site planning checklist, 1-2
space planning, 3-1
specifications
AC power, 4-2
pedestal system, A-1
rack-mountable system, A-7
split-phase circuit connections
120–240 V AC, B-6
standards compliance, C-1
star ground, B-2
switches, network, 3-2
system power cords, 4-7

T

Technical Support, 1-2
Technical Support, getting assistance, 1-2
telephone lines
for ASN modem assembly, 1-3, 6-2
for support calls, 1-3, 6-2
three-phase circuit connections
208 V AC, B-7, B-8
380 V AC, B-9

U

UPS
PDU connections, 5-3
pedestal system connections, 5-5
site planning, 5-1
system connections, 5-4

V

Virtual Technician Modules. See VTMs
VTMs, site planning, 1-3

W

wiring, electrical, B-1